COMPARISON OF BATSE, COMPTEL, EGRET, AND OSSE SPECTRA OF GRB 910601

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14. ABSTRACT
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ABSTRACT

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INTRODUCTION

The burst of 1991 June 1 provided the first opportunity to compare the spectral responses of the four COMPTON Observatory experiments over a broad dynamic range. Schaefer, *et al.*[1], Winkler, *et al.*[2], Kwok, *et al.*[3], and Share, *et al.*[4] describe measurements individually made by the BATSE, COMPTEL, EGRET, and OSSE instruments, respectively. This burst occurred in the field of view of two of the OSSE detectors. Its location is depicted in Figure 1 which displays the individual error boxes derived from the OSSE and COMPTEL instruments; also shown is the arc derived from the interplanetary network (see Hurley *et al.* these Proceedings). The best source location is derived from the intersection of the COMPTEL error circle with the IPN arc. This position was used to derive the spectrum of the burst from OSSE; we estimate that there is $\sim 10\%$ error in the flux due to the uncertainty in position.

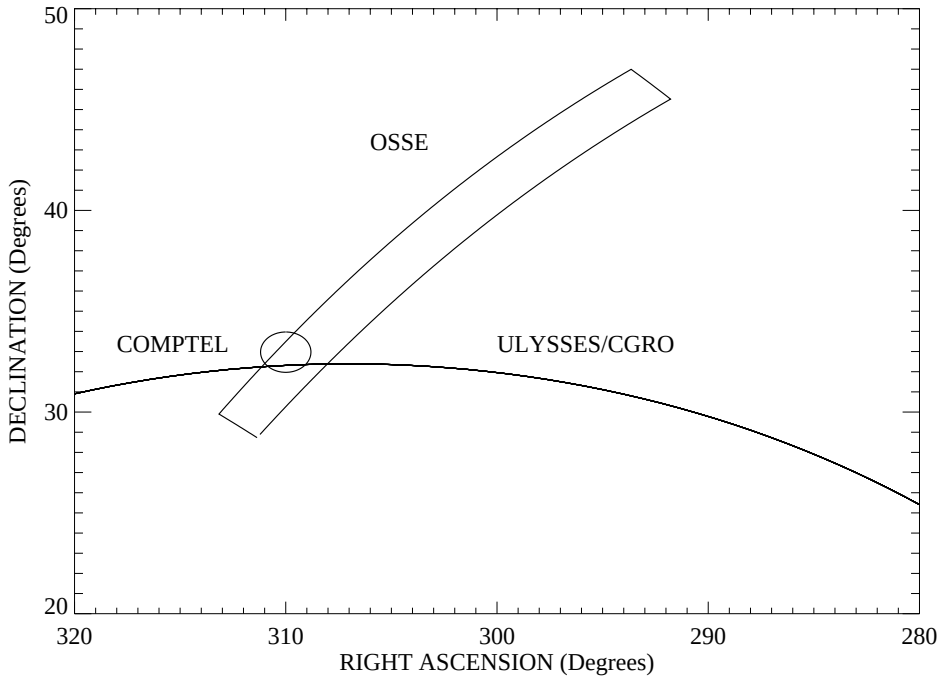

Figure 1. Positions for the source of the June 1 burst derived from COMPTEL (oval), OSSE (error box) and CGRO/Ulysses (arc).

The burst history recorded >100 keV by the summed shield elements of OSSE is displayed in Figure 2. BATSE triggered on the small peak at 4 s. OSSE accumulated spectral data in three 16.38 s intervals during the burst. Spectral comparisons with BATSE were made during interval #1 and are described in the next section. OSSE spectral comparisons with COMPTEL and EGRET were from data summed over all three intervals; the time interval over which the EGRET spectrum was accumulated is not identical with OSSE but does encompass a bulk of the emission shown in Figure 2.

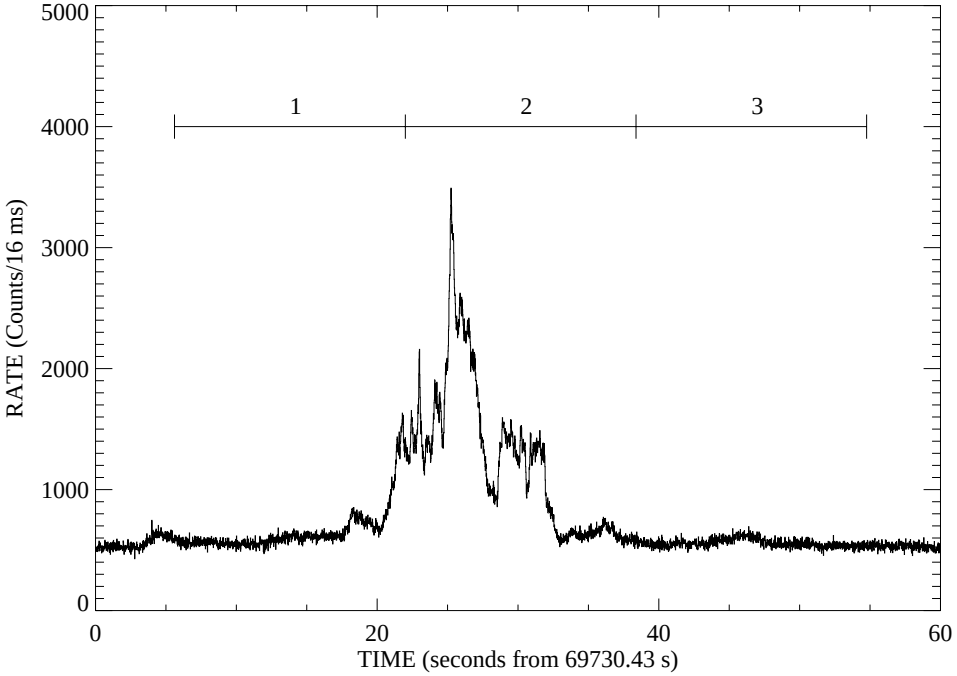

Figure 2. Count rates >100 keV recorded at 16 ms resolution by OSSE annular shields. Intervals in which spectra were accumulated are shown.

SPECTRAL COMPARISONS

Figure 3 shows the spectra measured by two of the OSSE detectors (summed together), the large EGRET NaI crystal (TASC), COMPTEL's D2 NaI detector, and the COMPTEL telescope; upper limits are shown for the EGRET spark chamber over this time interval. The agreement between all the measurements is good, although the COMPTEL spectra appear to be harder than those of either OSSE or EGRET. A clearer comparison is revealed in Figure 4 where the differential spectral points are multiplied by E^2. The solid line is a fit to the OSSE data with a model consisting of the sum of an exponentiated power law and a high-energy power law.

Spectral data from BATSE are only available for the early part of this burst. BATSE detector module #2 had minimum exposure to scattered radiation from the earth; this was thus used for comparison. Spectra from both the large area detector (LAD) and spectroscopy detector (SD) are compared with the OSSE spectrum in Figure 5. The SD data are in excellent agreement with OSSE over the full range in energy. The LAD and OSSE data agree quite well

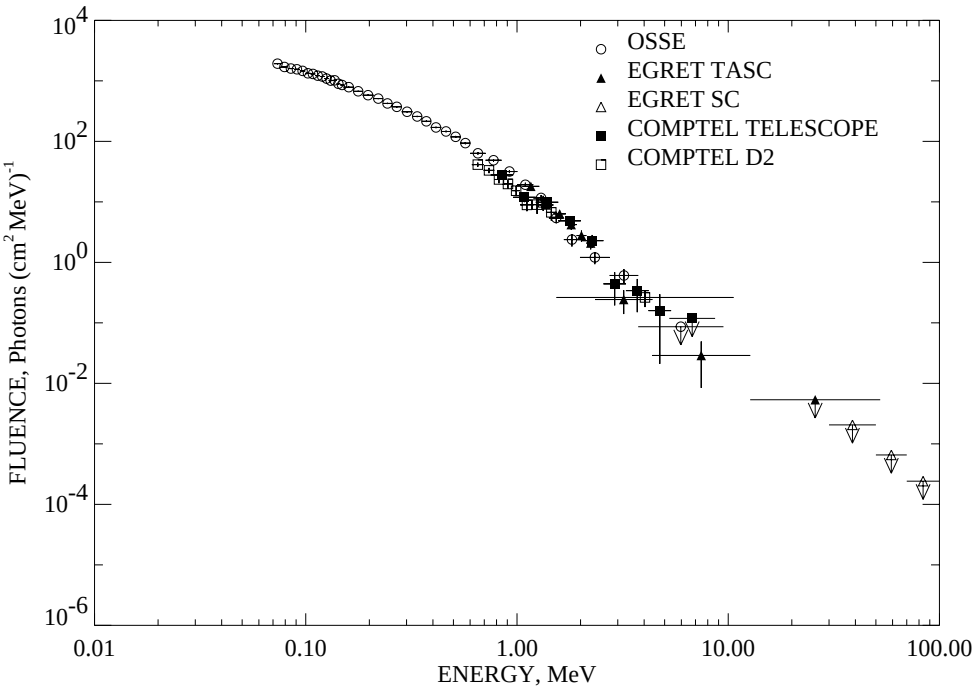

Figure 3. Integrated photon spectra from COMPTEL, EGRET, and OSSE measurements.

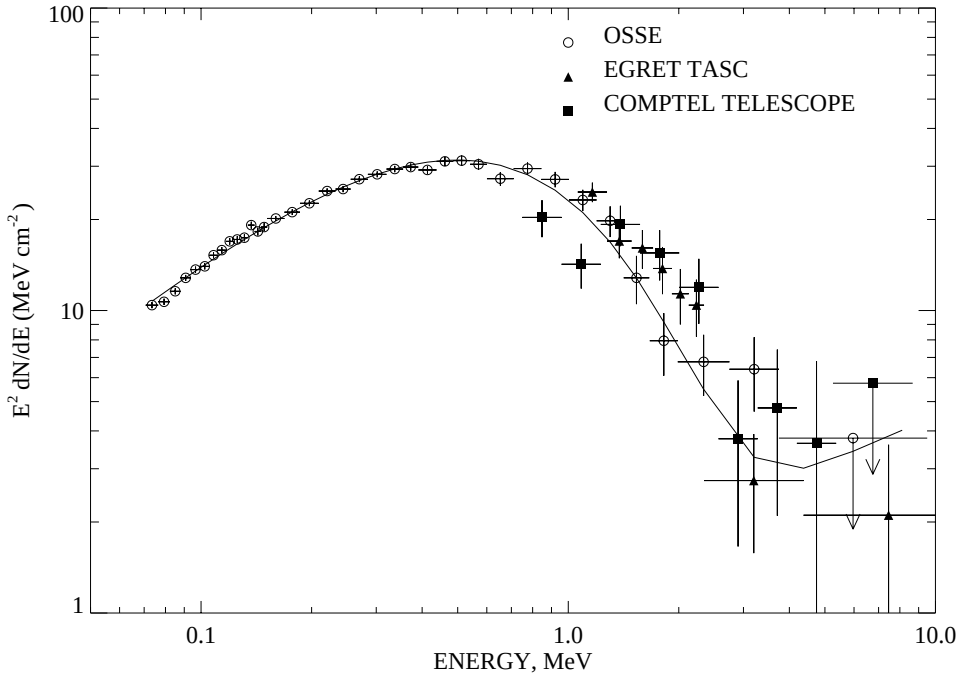

Figure 4. Integrated photon spectrum from COMPTEL, EGRET, and OSSE measurements.

<0.6 MeV; the LAD data points fall systematically below those of OSSE at higher energies. This could be due to uncertainties in the instrument response function for these relatively thin detectors near 1 MeV. The solid curves show a fit to the OSSE data.

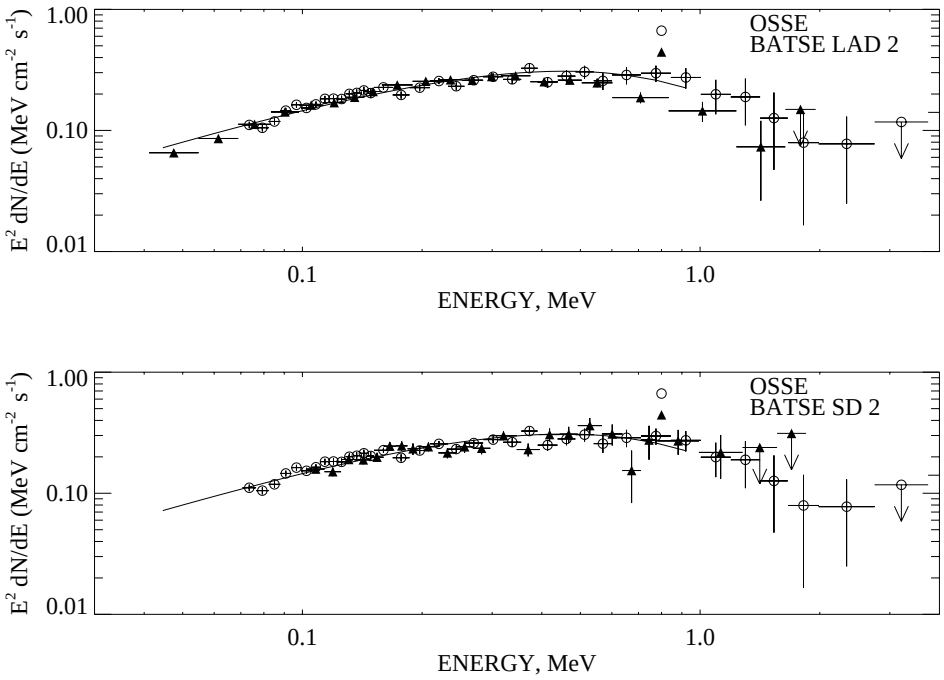

Figure 5. Comparison of BATSE LAD and SD spectra with OSSE spectra early in the burst.

These comparisons indicate that the full complement of detectors on the COMPTON Observatory can be used to construct spectra of bursts over a broad range in energies, from ~ 0.05 to ~ 1000 MeV. Further evidence for the good agreement between BATSE, COMPTEL, and EGRET spectra of bursts is given by Schaefer, *et al.* in these Proceedings.

It is also clear from Figures 3-5 that there is no evidence for any spectral features superimposed on the broad continuum in this burst. The measured fluence of the burst is $\sim 1.2 \times 10^{-4}$ erg cm^{-2} >70 keV.

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